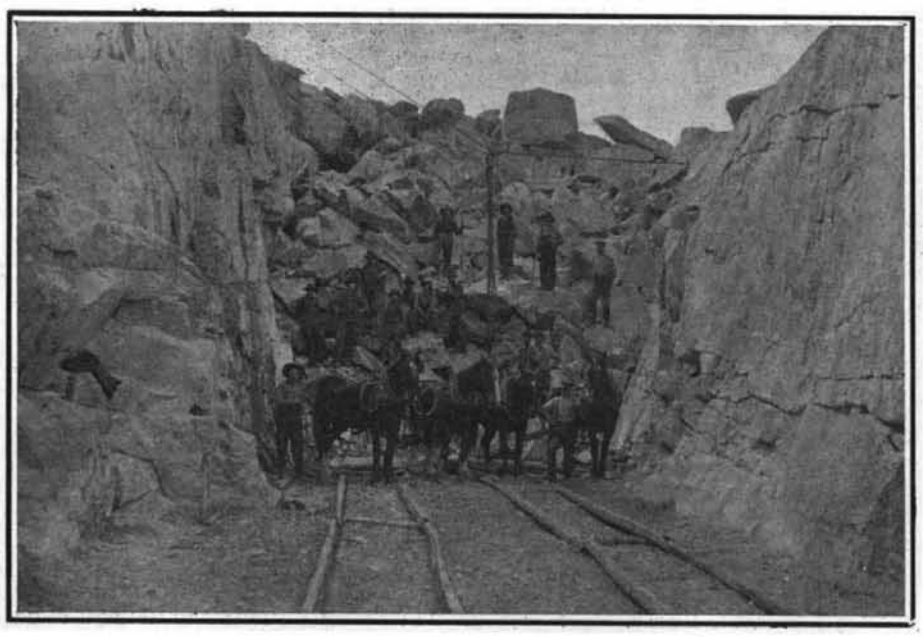
NEW RAILROAD CONSTRUCTION IN CANADA AND THE NORTHWEST.

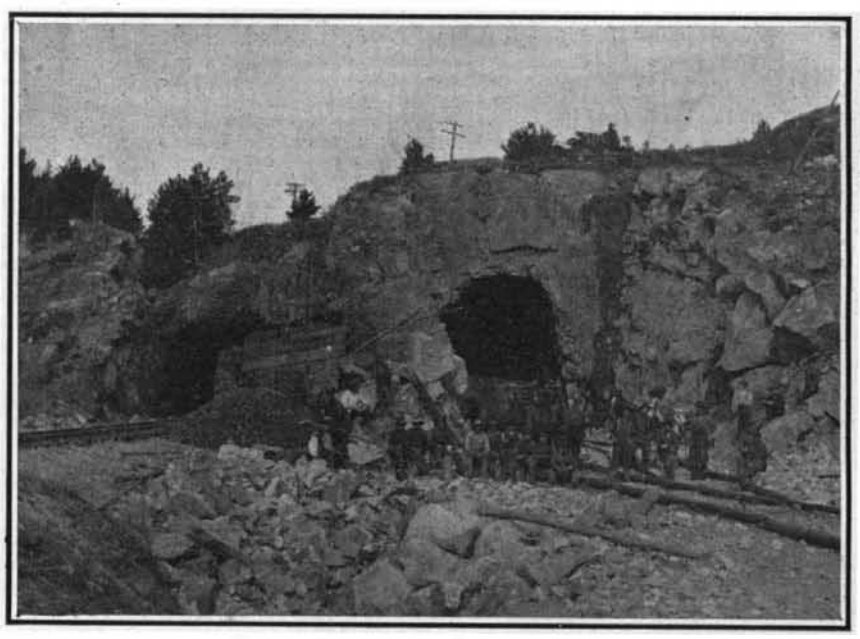
BY DAY ALLEN WILLEY.

The United States west of the Mississippi River is the principal field for railway builders, as might be expected. The most important undertaking in the Western States, however, is the extension of the Chicago, Milwaukee & St. Paul Railway from its present western terminus to the Pacific coast. This is one of the most extensive individual projects ever undertaken in railroad building in the United States, as it represents no less than 1,700 miles of new line. The Western Pacific, which is being completed through California and Nevada, represents 750 miles, and will form the western extension of a system reaching across the continent, since it will form a portion of the Gould lines which now extend from the eastern terminus of the Western Pacific as far east as the city of Buffalo, New York. In the Pacific Northwest the Great Northern Railway Company is building an extension from the city of Spokane in eastern Washington by way of the Columbia River Valley to Portland, Ore. By the completion of this work the Great Northern will secure a second seaport on the Pacific Ocean in addition to the one which it now has on Puget Sound.

The work of the railroad builders in northwestern Canada, however, is remarkable for its extent, considering the comparatively small mileage which has been completed in this section. The new road is being built for the purpose of developing the immense territory available for agriculture which is embraced in the province of Manitoba, and the territories of Alberta, Assiniboia, and Saskatchewan. Until recently, one company had a practical monopoly of all the traffic from this section of Canada, but at the present time four large corporations are carrying out plans for railway extension, in addition to the number of what might be called local projects. The Canadian Pacific, which at the present time has the unique distinction of controlling the only railway which extends entirely across America, has found it necessary to let contracts for a number of extensions northwest from Winnipeg to reach the great wheat belt in this section of the Dominion. The longest of these extensions will terminate at Edmonton in the Saskatchewan Valley, 750 miles from Winnipeg. In addition to these projects, the company is expending $10,000,000 in enlarging the portion of its main line between Winnipeg and Fort William on Lake Superior. This section is termed the "Spout," for the reason that it is the principal route for the bulk of the grain which is shipped east from northwestern Canada and either stored in the elevators at Fort William and Port Arthur for shipment by lake, or sent by rail through Canada to the seaports on the St. Lawrence River for export. The grain traffic has increased to such an extent that a second track has become necessary, and work on this is now in progress. The construction of this additional mileage was begun in September, 1905, and it is expected that all of it will be completed within the next two years. In all, 425 miles of track will be laid. A portion of it will be built through a region in which an immense amount of excavation will be necessary in rock formation. The accompanying photographs give an idea of the difficulty of this work. In some places the rock cuts are over 25 feet deep. While steam drills are employed to some extent, much of the drilling is done by hand. A force of 1,600 men is employed on this section alone, which represents about 100 miles of the work.



A Deep Rock Cut Near Busteed, Ontario.



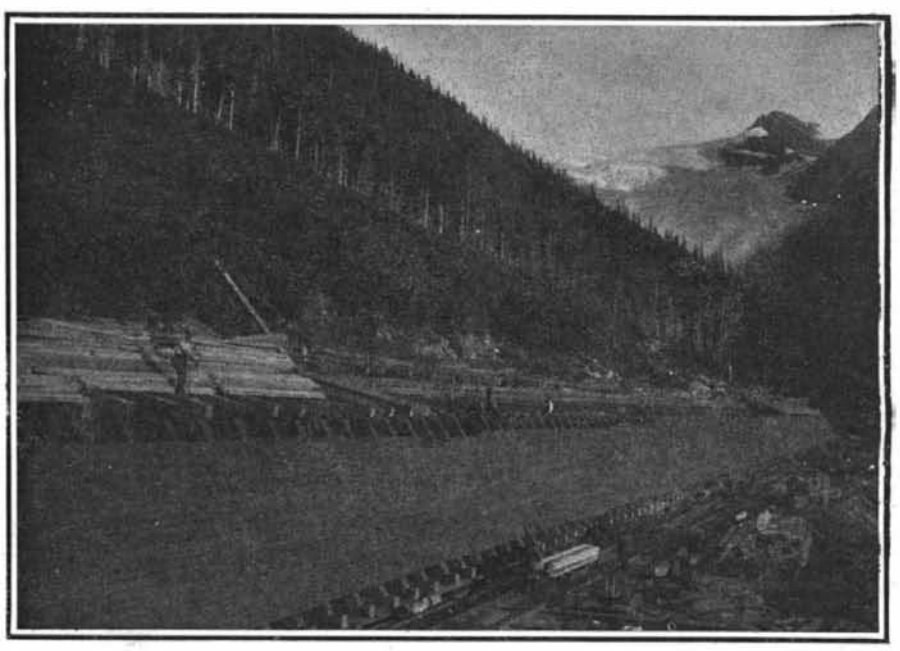
A Tunnel for the Second Track Near Kolmar, Ontario.

As far as possible, the steam shovel is employed. On the division east of Winnipeg Mr. W. A. James, the engineer in charge, has used from ten to twelve power shovels when the weather would permit, the machines being provided with dippers holding 3½ cubic yards. During the winter season, however, the weather is such that very little work can be done upon the extra track, and most of the construction has to be performed during the six favorable months of the year, and this accounts for the length of time which will be required for its completion.

Another important extension of the Canadian Pacific, which has been completed in British Columbia, through one of the most mountainous sections of the Northwest, necessitated the building of numerous bridges, as well as much tunnel excavation. As will be noted by the illustrations, the work is of a very substantial character and includes some important viaduct and bridge work.

The enlargement of the Grand Trunk Railway into the Great Trunk Pacific means the completion of another transcontinental line, which will be fully 5,000 miles in length, reaching from Moncton, New Brunswick, to Port Simpson on the Pacific Coast. The surveys for this route required several years to complete, and the line lies farther north than any east-and-west railroad which has yet been planned in America, much of it traversing a section which at present is an unbroken wilderness. Contracts have been let and a considerable mileage of the Grand Trunk Pacific will be completed during the present year. Another ambitious project is that of the Canadian Northern, which already has built a network of lines in Manitoba and adjacent territory. Its track is finished to the city of Edmonton, and it also reaches Lake Superior at Fort William and Port Arthur. This company expects to utilize Hudson Bay as a route for exporting grain and other products from the Canadian Northwest. From the heart of the wheat belt to the Bay is about 700 miles, and surveys have been completed by the Canadian Northern for a practicable route. Recent investigation has shown that the water of Hudson Strait, which connects the bay with the Atlantic, is free from ice for fully one-third of the year, and it could be kept open fully two-thirds of the year by ice breakers, while there is open water in the bay itself all the year round. A glance at the map shows that this route is considerably the shortest to Europe from the Canadian Northwest, a haul of nearly 1,000 miles over land being avoided. Consequently, grain sent by this northeast gateway across the Atlantic can be transported at a much smaller expense than by any of the present routes through Canada or the United States. This is why the Canadian Northern has determined to build an extension through what is practically an uninhabited country. Several other independent companies have secured charters from the Dominion authorities to build lines northward to the same body of water.

During the present year, work will be in progress on two more systems which will connect the city of Winnipeg with the Pacific coast. When these are completed three lines will traverse Northwestern Canada from eastern Manitoba to the ocean, for in addition to the Grand Trunk Pacific project, James J. Hill has completed arrangements for a line which will pass through southern Manitoba, Alberta, and British Columbia, terminating at the city of Vancouver. This will form a Canadian division of the Great Northern system and including branches will be 1,300 miles in length. The route surveyed is nearly parallel to the Canadian Pacific, and traverses not only the extensive



Building Snow Sheds Near Glacier House, B. C.

Snow Sheds on the Canadian Pacific, Showing the Hermit Range.

NEW RAILROAD CONSTRUCTION IN CANADA AND THE NORTHWEST.

wheat-growing region, but the live stock country of Alberta, and that important section on which irrigation is being carried out on a large scale, as recently noted in the SCIENTIFIC AMERICAN.

THE ECONOMICAL SURFACE MINING OPERATIONS OF CUBA.

BY L. B. WARD.

In Cuba the natural mining facilities are such that the processes are extremely simple and free from the many dangers incidental to the usual mining operations. Because of the accessibility of the ore, and ease with which it is mined, Cuba's mines are fast becoming her chief source of wealth, and mining her chief industry. Gold, lead, zinc, and asphalt are known to exist; and copper and manganese are found in sufficient quantities to warrant their profitable exploitation; but iron is most abundant, and the ore is so accessible, that the iron mines are being developed rapidly and are yielding large profits.

The hilly province of Santiago abounds in minerals; and her iron ore deposits are as remarkable in their way as the fabulous mines of the Lake Superior region. Indeed, the ore is even easier of access. There is no shaft sinking, no tunneling (with the exception of an occasional exploration tunnel); in fact there is no underground work at all. Hence the miners are not exposed to the many dangers of the usual mines, such as cave-ins, floodings, fires, and explosions; nor is the expensive equipment used in the ordinary mines necessary.

The mining is all open-cut work and terracing. At Daiquiri, where the mines are already extensively developed, and new companies are starting operations, the iron ore occurs on the hillsides, and it is obtained by open-cut work and terracing. Viewed from some little distance, one would suppose the hill was being removed *in toto*, and never for an instant would the spectator imagine that he was viewing a mine in full operation.

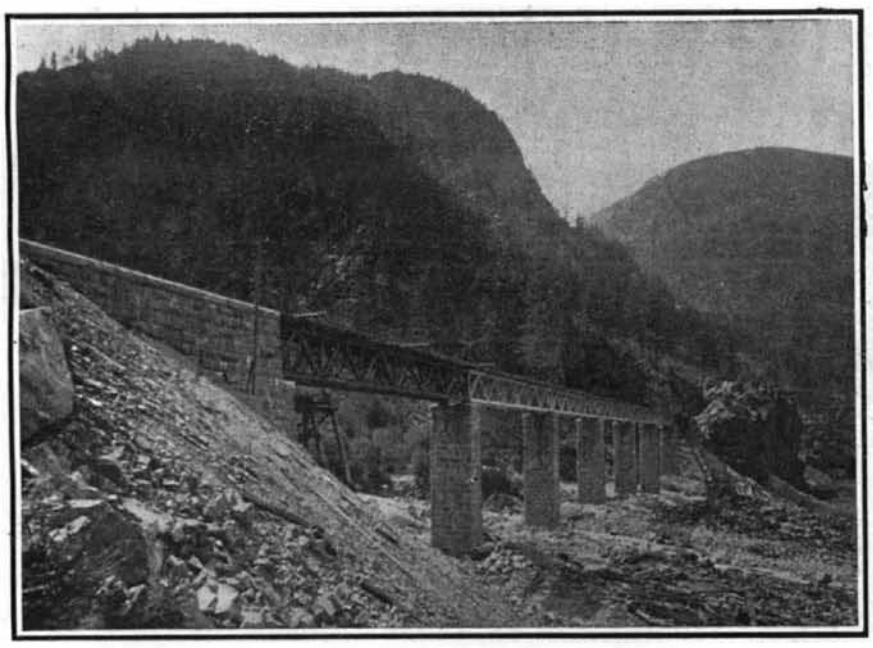
Each broad terrace ledge is laid with narrow-gage tracks, over which the ore is hauled to the regular main track and transported by rail to Santiago Bay, whence it is shipped to various points.

From the mines at Daiquiri 3,536,121 tons of ore were produced to December 31, 1906. The production for the year of 1906 was 510,500 tons. This ore has all been shipped to the United States, with the exception of 75,000 tons, which went to England, Germany, Belgium, and Cape Breton, Nova Scotia.

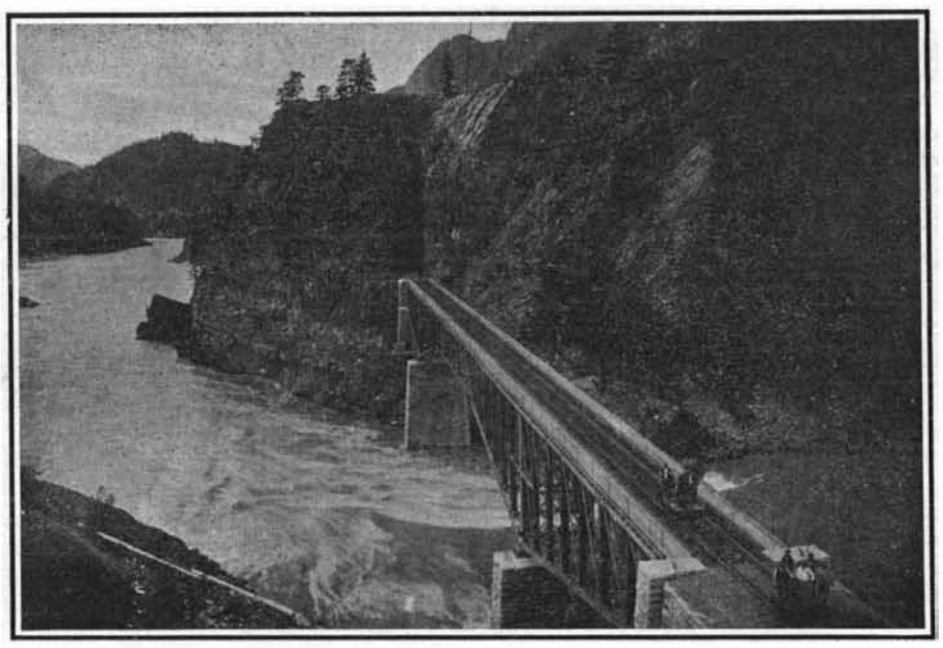
There are also several large iron mines on the north coast, in the Mayari Mountains back of Nipe Bay, that are being extensively developed, and a broad-gage railroad is under construction from the mines to the bay at Cagimaya, where are two wharves and other necessary equipment for handling the ore economically and shipping it to the United States. It is estimated the shipments from these mines will amount to over 1,000,000 tons annually.

An American company, operating not far from Daiquiri, shipped its first ore in 1884, since when 5,000,000 tons have been produced, and the bulk of this output has been shipped to the United States.

The copper mines of southern Santiago are of high value, and at one time they were worked extensively. During the war of 1898, however, the works were entirely destroyed. For the twenty-three years prior to that date the output of copper was valued at $50,000,000.



Canadian Pacific Bridge Across White's Creek, Fraser Canyon.



The Cisco Cantilever Bridge Across the Fraser River.

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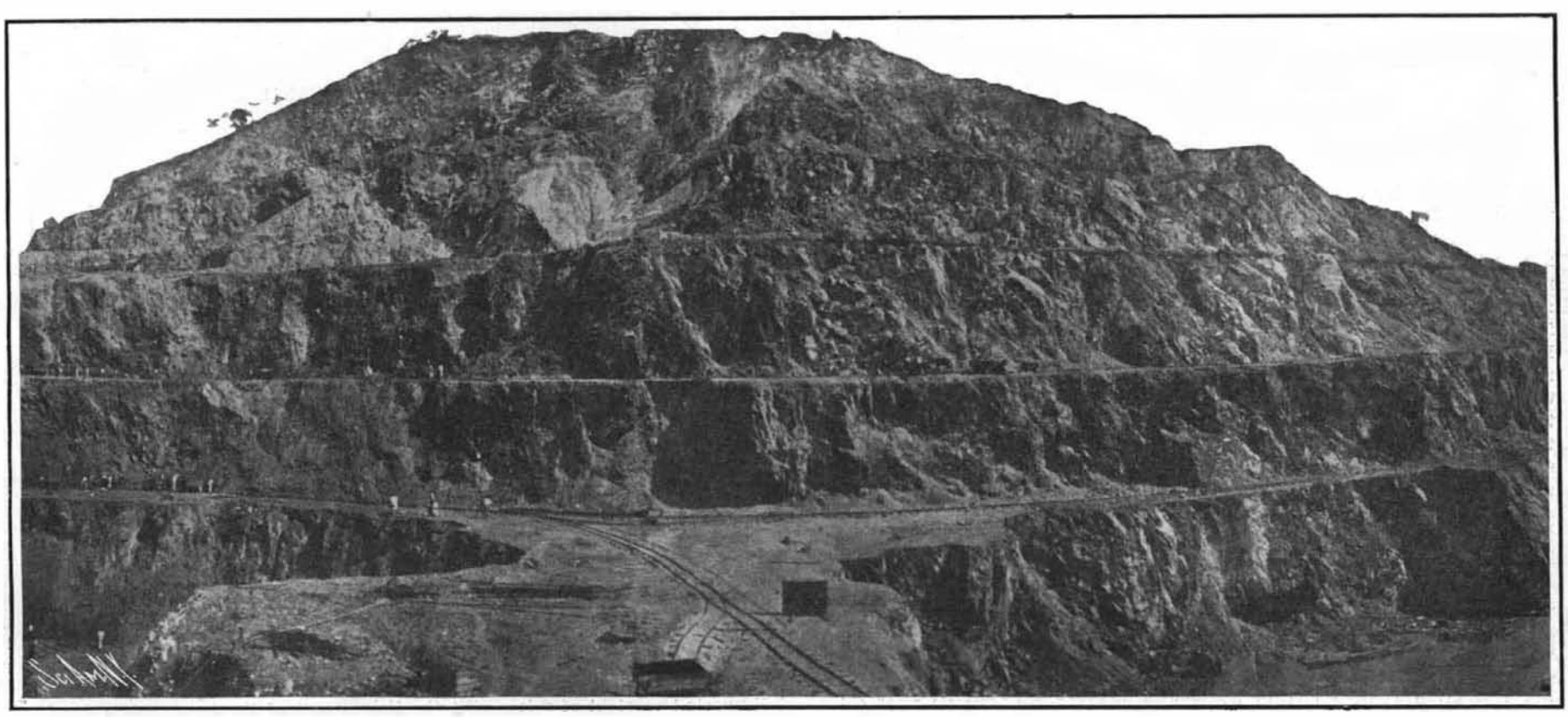
An Electrolytic Transformer.

Alternating currents are at present used preferably in electric plants both for power and lighting purposes, and electric energy is usually distributed in Europe to consumers in this kind of current, though for certain special purposes, a conversion to continuous current is found desirable. As the devices constructed for this purpose are far from being satisfactory, endeavors have been made from time to time to design an electrolytic transformer based on the principle that in an electrolytic trough comprising an aluminium and a lead electrode. The current will be allowed to pass only in case the aluminium forms the cathode or negative electrode, while it is arrested in the opposite case by the layer of aluminium oxide formed by the current. A rather promising apparatus embodying this principle was demonstrated a short time ago by its inventor, O. de Faria, before the French Physical Society. The drawbacks inherent in all previous apparatus of the same kind, viz., polarization of the electrodes and excessive heating of the electrolyte, are eliminated by a convenient choice of the electrodes and liquid. Furthermore, an automatical circulation of the electrolyte is obtained by means of convection currents in the liquid mass. Sodium phosphate is used as the electrolyte, and pure commercial aluminium and antimony-lead as electrode mass. Owing to the circulation of the liquid, the temperature cannot exceed certain limits, while any polarization is entirely done away with. The efficiency of the apparatus varies between sixty-five and seventy-five per cent in watts. The main uses of the apparatus are the charging of accumulators and operation of induction coils, arc lamps, mercury lamps, continuous-current motors, electroplating plants, etc.

To Remove Oil Paint from Tin Goods.—In the case of fresh paint, rub off with oil of turpentine or petroleum. Otherwise, use hot, saturated solution of potash, hot water afterward. The most powerful means is caustic soda lye.



This Mountain of Rich Ore Is Being Mined by the Simple Process of Excavation in Terraces, Upon Which the Tracks Are Laid, and the Cars Loaded for Shipment Direct to the Docks.

THE REMARKABLE SURFACE MINES OF CUBA.

SCIENTIFIC AMERICAN

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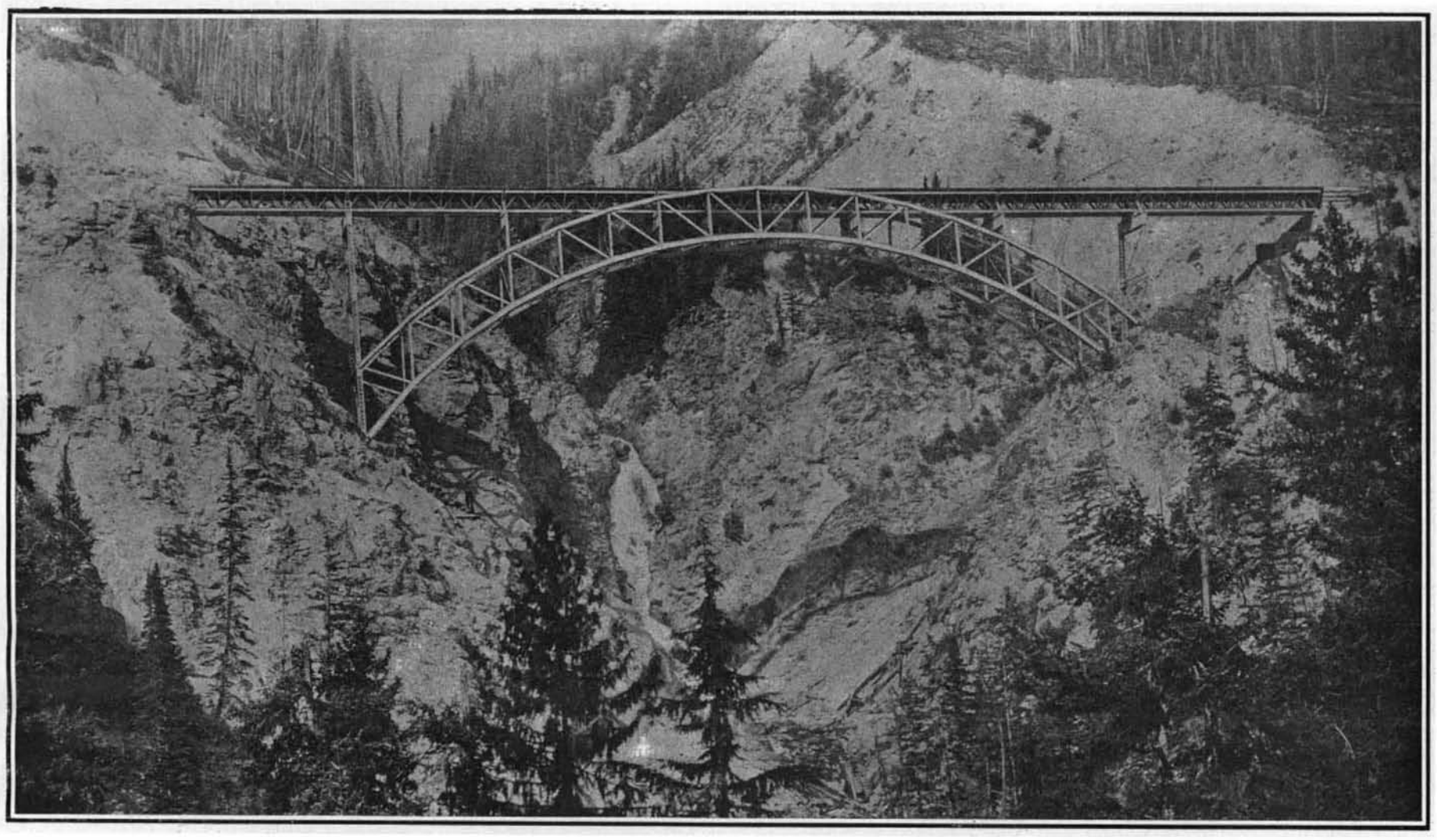
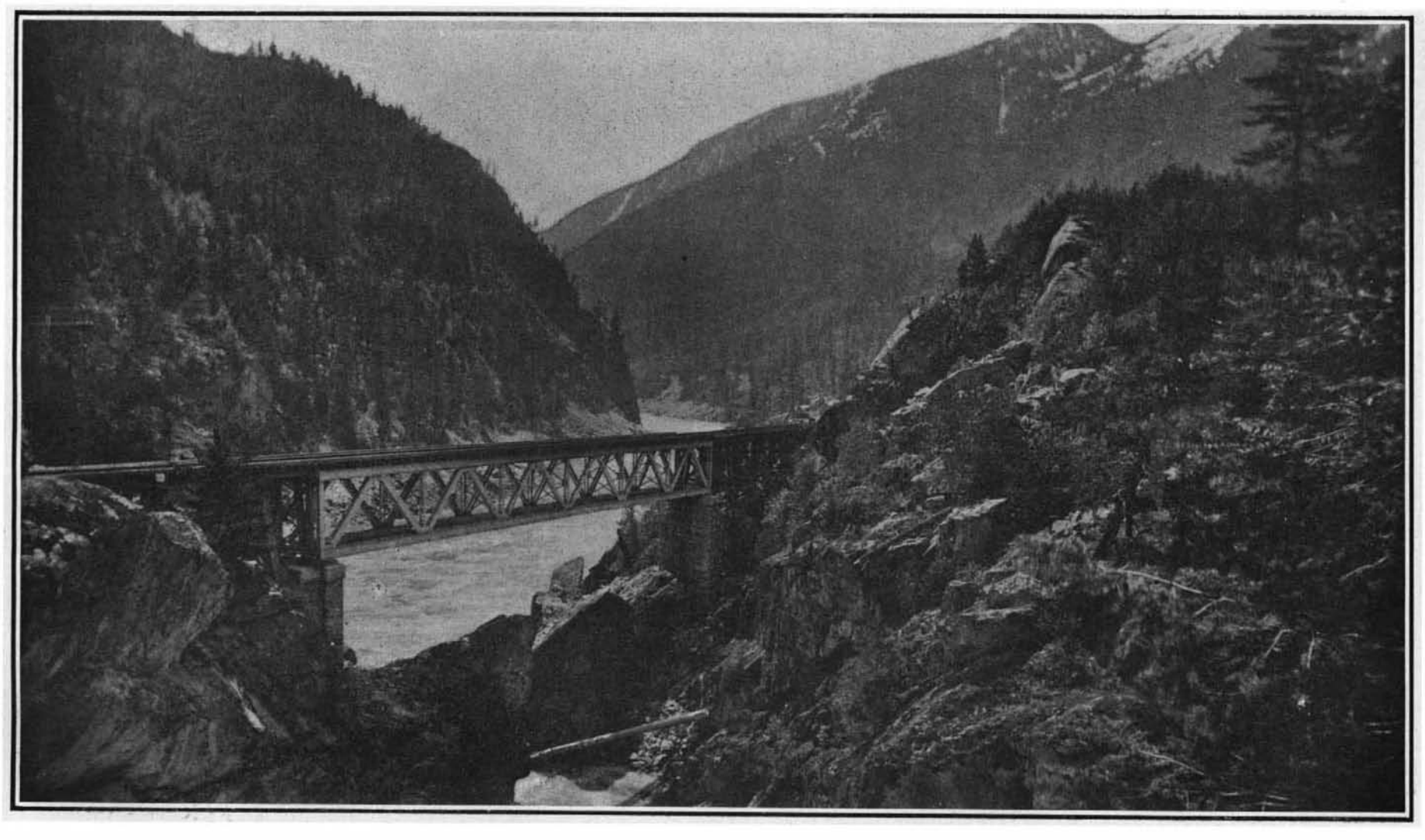


Stoney Creek Bridge, Selkirk Range, on the Canadian Pacific.



Canadian Pacific Railroad Bridge Across the Skuzzy River, Fraser Canyon.

NEW RAILROAD CONSTRUCTION IN CANADA AND THE NORTHWEST.—[See page 10.]